

What is claimed is:

[Claim 1] 1. A brushless motor drive device comprising:

a comparing circuit for comparing a drive signal and a reference signal to generate a pulse signal, the drive signal being associated with a rotation of a brushless motor and a frequency of the reference signal being higher than a frequency of the drive signal;
a switching circuit coupled between a drive voltage source and the brushless motor and controlled by the pulse signal for driving the brushless motor;
means for adjusting a relative relationship between an amplitude of the drive signal and an amplitude of the reference signal in accordance with a current error signal representative of a difference between a current command signal and a motor drive current; and
a limiting circuit for limiting a duty ratio of the pulse signal.

[Claim 2] 2. The device according to claim 1, wherein:

the drive signal is a sinusoidal signal.

[Claim 3] 3. The device according to claim 2, wherein:

the drive signal is superposed with a correction signal for compensating a turn-on delay.

[Claim 4] 4. The device according to claim 1, wherein:

the reference signal is a triangular signal, in which an average value of an amplitude of the triangular signal substantially coincides with an average value of the amplitude of the drive signal.

[Claim 5] 5. The device according to claim 1, wherein:

the reference signal is formed by an upper triangular signal and a lower triangular signal, in which a valley of the upper triangular signal substantially

corresponds in time to a peak of the lower triangular signal, and substantially coincides with an average value of the amplitude of the drive signal.

[Claim 6] 6. The device according to claim 1, further comprising:

a Hall sensing circuit for generating a positional detection signal representative of a positional relationship between a rotor and a coil of the brushless motor, and

a synthesizing circuit for generating the drive signal in response to the positional detection signal.

[Claim 7] 7. The device according to claim 6, wherein:

the current error signal is supplied to the Hall sensing circuit for adjusting an amplitude of the positional detection signal.

[Claim 8] 8. The device according to claim 6, wherein:

the current error signal is supplied to the synthesizing circuit for adjusting the amplitude of the drive signal.

[Claim 9] 9. The device according to claim 1, wherein:

the switching circuit comprises:

an upper-side switch coupled between the drive voltage source and the brushless motor, and

a lower-side switch coupled between the brushless motor and a ground potential, in which:

when the upper-side switch is turned ON/OFF in accordance with the pulse signal, the lower-side switch is synchronously turned OFF/ON in accordance with the pulse signal.

[Claim 10] 10. The device according to claim 1, wherein:

the switching circuit comprises:

an upper-side switch coupled between the drive voltage source and the brushless motor, and

a lower-side switch coupled between the brushless motor and a ground potential, in which:

when the upper-side switch is turned ON/OFF in accordance with the pulse signal, the lower-side switch keeps OFF, and

when the lower-side switch is turned ON/OFF in accordance with the pulse signal, the upper-side switch keeps OFF.

[Claim 11] 11. The device according to claim 1, wherein:

the limiting circuit comprises:

means for generating a positive-half duty-ratio limit signal, and

means for generating a negative-half duty-ratio limit signal.

[Claim 12] 12. The device according to claim 11, wherein:

the limiting circuit further comprises:

means for preventing a HIGH time of the pulse signal each cycle from continuing longer than a HIGH time of the positive-half duty-ratio limit signal each cycle, and

means for preventing a LOW time of the pulse signal each cycle from continuing longer than a LOW time of the negative-half duty-ratio limit signal each cycle.

[Claim 13] 13. The device according to claim 1, wherein:

the current error signal is supplied to adjust the amplitude of the drive signal.

[Claim 14] 14. The device according to claim 1, wherein:

the current error signal is supplied to adjust the amplitude of the reference signal.

[Claim 15] 15. A brushless motor drive device comprising:

a comparing circuit for comparing a drive signal and a reference signal to generate a pulse signal, the drive signal being associated with a rotation of a brushless motor and a frequency of the reference signal being higher than a frequency of the drive signal;
a switching circuit coupled between a drive voltage source and the brushless motor and controlled by the pulse signal for driving the brushless motor;
means for adjusting a relative relationship between an amplitude of the drive signal and an amplitude of the reference signal in accordance with a current error signal representative of a difference between a current command signal and a motor drive current; and
a limiting circuit for preventing a frequency of the pulse signal from being lower than the frequency of the reference signal.

[Claim 16] 16. The device according to claim 15, wherein:

the limiting circuit comprises:
means for generating a positive-half limit signal, and
means for generating a negative-half limit signal.

[Claim 17] 17. The device according to claim 16, wherein:

the limiting circuit further comprises:
means for preventing a HIGH time of the pulse signal each cycle from continuing longer than a HIGH time of the positive-half duty-ratio limit signal each cycle, and
means for preventing a LOW time of the pulse signal each cycle from continuing longer than a LOW time of the negative-half duty-ratio limit signal each cycle.

[Claim 18] 18. The device according to claim 15, further comprising:

a Hall sensing circuit for generating a positional detection signal representative of a positional relationship between a rotor and a coil of the brushless motor, and
a synthesizing circuit for generating the drive signal in response to the positional detection signal.

[Claim 19] 19. The device according to claim 18, wherein:
the current error signal is supplied to the Hall sensing circuit for adjusting an amplitude of the positional detection signal.

[Claim 20] 20. The device according to claim 18, wherein:
the current error signal is supplied to the synthesizing circuit for adjusting the amplitude of the drive signal.